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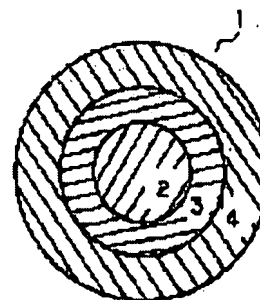
(54) CATALYST STRUCTURE BODY FOR PURIFYING EXHAUST GAS

(57)Abstract:

PROBLEM TO BE SOLVED: To contrive improvement of purification efficiency of particulates in exhaust gas without increasing the formed quantity of sulfate in a wide range of temperature.

SOLUTION: A catalyst structural body for purifying exhaust gas in which a monolithic honeycomb body supports catalysts consists of a multilayer structure 1 concentrically constituted in the flow direction of exhaust gas to the structural body. The number of cells of the layer is increased from the outer peripheral side toward the center side, and a catalyst of strong oxidation power and a catalyst of weak oxidation power are supported in the central part and in the peripheral part viewed from the flow direction of the exhaust gas respectively.

Preferably, the multilayer structure 1 is that which three layers (an inner layer 2, an intermediate layer 3, and an outer layer 4) concentrically constituted are combined with each other to form. The numbers of cells per square inch are 300~500, 200~400 in the inner, intermediate and outer layers respectively. The cross-sectional ratios are 0~20, 30~70 and 30~70 in the inner, intermediate and outer layers respectively. The active components are



combinations of Pt, Pd; Pd, Ag, Rh; and Rh, Ir, Cu in the inner, intermediate and outer layers respectively.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the equipment which can purify efficiently an internal combustion engine, especially the exhaust gas taken out from the diesel power plant.

[0002]

[Description of the Prior Art] Although the exhaust gas taken out by the internal combustion engine flows the inside of an exhaust pipe way and it is finally emitted outside, after exhaust gas is purified, to be emitted outside is demanded so that harmful matter may not be emitted outside as it is. About the exhaust gas taken out from the diesel power plant, it adds to the reduction which is nitrogen oxides (NOx), and, recently, particulate reduction of a hydrocarbon, carbon, etc. is also called for from a viewpoint on an environment.

[0003] The thing of the type used as a particulate filter from the former had that common by which the both-sides end face which is the monolith object of the shape of a honeycomb a countless stoma comes to be open for free passage of the shape to the flow direction of exhaust gas, and was wide opened to the flow direction of exhaust gas formed the flat surface, and the magnitude of a stoma was designed by homogeneity. When exhaust gas flows the inside of such a filter, it does not necessarily flow by the uniform flow rate, and a flow rate becomes less toward the periphery section from the center section. in order [therefore,] to raise the particulate collection efficiency of a filter -- publication of unexamined utility model application Heisei 5-32715 -- a catalyst -- the exhaust gas purge with which equalizing the flow of exhaust gas in the living body is proposed, and it comes to arrange two monolith type catalyst objects of a configuration special in one catalyst case as the somatization object is indicated. Moreover, the particulate filter of a configuration of that apply to the support by the side of an inner layer from the support by the side of an outer layer, and the number of cels becomes large gradually is indicated by publication of unexamined utility model application Heisei 4-231614 so that back pressure may become [back pressure] low highly by the inner layer side by the outer layer side. However, since it is not only difficult, but the particulate was purified by only the absorption, things' [no] proposed also including the above-mentioned thing improved, so that manufacture also expected purification effectiveness.

[0004] Therefore, recently, purifying by oxidizing a particulate using a catalyst is proposed. However, although a particulate can be purified by making the weak catalyst of oxidizing power contact at the time of the property top elevated temperature, it is known that oxidation of SO₂ contained in coincidence will progress into exhaust gas by the powerful oxidizing power which a catalyst has when the strong catalyst of oxidizing power is made to contact at the time of an elevated temperature, and SO₃ and sulfuric acid mist ("sulfate" is called hereafter) which are harmful matter will be generated. Therefore, when this technique was used, two or more catalyst equipments were formed so that either the oxidation engine performance in a low-temperature region or the control function of sulfate generating in a pyrosphere might be sacrificed, the configuration of a catalyst purge might be complicated, namely, it could respond to both a low-temperature region and a pyrosphere, and it was thought that the flow of exhaust gas had to be changed according to the temperature of exhaust gas.

[0005]

[Problem(s) to be Solved by the Invention] So, this invention aims at offering the equipment which is efficient and can purify the particulate which canceled the above-mentioned fault, and which is a simple configuration and is contained in exhaust gas over a large temperature region, without increasing generation of sulfate.

[0006]

[Means for Solving the Problem] this invention person supports wholeheartedly two or more kinds of catalysts from which oxidizing power differs on a catalyst object as a result of research -- making -- and exhaust gas -- the temperature -- responding -- this catalyst -- it succeeded in moreover avoiding increasing generation of sulfate, gathering the particulate purification effectiveness in exhaust gas by constituting specific passage in the living body so that it may flow spontaneously.

[0007] Namely, this invention is the catalyst structure for exhaust gas purification with which the catalyst was supported by the honeycomb-like body of a monolith type. It consists of multilayer structure constituted by concentric circular to the flow direction of the exhaust gas of this structure. It is characterized by for the number of cels of a layer increasing toward a core side from a periphery side, for the strong catalyst of oxidizing power being supported by the core seen from the flow direction of exhaust gas, and the weak catalyst of oxidizing power being supported by the periphery section. Preferably, the area ratio of the layer of a core to the total cross section is 5% - 50%.

[0008] Since the rate of flow of exhaust gas is slow when the catalyst structure of the configuration of this invention is used, and engines, such as the time of starting, are under low-speed rotation and low loading, the diffusion function to the direction of a periphery is low, and mainly flows into a core. Since the strong catalyst of oxidizing power, i.e., the catalyst which has oxidizing power also in a low-temperature region, is supported by the core, the particulate in exhaust gas oxidizes and is reduced efficiently. On the other hand, since the number of cels has decreased as the rate of flow of exhaust gas is quick and it goes to the periphery section from the core of the structure when engines, such as the time of steady operation, are under high-speed operation and a heavy load, it collides with the cell wall of a core, and under the influence of the collision, exhaust gas is diffused in the direction of a periphery, and enters into the structure from there. Sulfate is not generated, although the particulate in exhaust gas oxidizes and is reduced, since the weak catalyst of oxidizing power, i.e., the catalyst for which oxidizing power does not have the generation function of sulfate weakly in a pyrosphere, is supported in the direction of a periphery.

[0009] Therefore, it can raise, without increasing the amount of generation of sulfate in the particulate purification effectiveness in exhaust gas over a large temperature region.

[0010]

[Embodiment of the Invention] Hereafter, one of the gestalten of operation of the catalyst structure of this invention is explained to a detail based on a drawing.

[0011] Structure drawing 1 is the schematic diagram of a perpendicular cross section to the flow direction of exhaust gas of one somatization object of the catalyst structure 1 for exhaust gas purification with which the active ingredient was supported by the honeycomb-like body of the monolith type concerning this invention. This structure is multilayer structure which was constituted by concentric circular to the flow direction of exhaust gas and with which it comes to combine three layers (3 middle lamella a inner layer 2, outer layer 4) mutually. In addition, it cannot be overemphasized that three or more layers are sufficient. From a viewpoint on industry, they are about ten layers in max. The strongest catalyst of oxidizing power is supported by the inner layer, the weakest catalyst of oxidizing power is supported by the outer layer, and the catalyst whose oxidizing power is middle is supported by the middle lamella. Moreover, the number of cels has most honeycomb objects of a inner layer, the honeycomb object of an outer layer has few cels, and the number of honeycombs of a medium-rise honeycomb object is middle. Moreover, it is desirable to constitute so that the cross section of a inner layer may become 20% or less of the whole. Like this equipment, when it considers as a three-tiered structure, if it sets up at a rate as shows the cross section and the number of cels of a honeycomb object in the following table 1, suitable effectiveness will be acquired.

[0012]

[Table 1]

	ハニカム体	
	断面積比	セル数 (／ i n c h ²)
内層	0～20	300～500
中層	30～70	200～400
外層	30～70	200～400

[0013] Moreover, a suitable result will be obtained, if it chooses as a catalyst (active ingredient) which a inner layer, a middle lamella, and an outer layer are made to support, respectively as shown in the following table 2.

[0014]

[Table 2]

	組み合わせ			
	1	2	3	4
内層	P t	P t	P t	P d
中層	P d	R h	A g	R h
外層	R h	I r	C u	I r

[0015] The catalyst structure for exhaust gas purification of manufacture approach this invention can be manufactured by making the honeycomb-like body of a monolith type support at least two kinds of active ingredients. Although the well-known manufacture approach can be used, it explains briefly also here. First, the honeycomb-like body of a monolith type is manufactured. With the quality of the material of the structure, although it is used by saying that the time amount to catalytic-activity-izing is short since [small] the temperature rise is quick, recently, the ceramic ingredient excellent in mechanical strengths, such as cordierite, or thermal resistance is also used [the specific heat] for metal, such as heat-resistant stainless steel. It is common to manufacture by the former's rolling the corrugated plate and plate made from a foil by turns, carrying out a time, considering as honeycomb structure, and joining a part or the whole by soldering etc. after that, and although the latter is manufactured by drying and calcinating corresponding ceramic powder after kneading a binder and water, such as alumina sol and a silica sol, and fabricating them to honeycomb structure after this, it is common.

[0016] It is desirable to use a ceramic ingredient as the quality of the material of a honeycomb-like body in the case of this invention.

[0017] Support of the active ingredient to a honeycomb-like body can be immersed in wash coat liquid (for example, gamma-alumina powder + alumina sol + water), can dry and calcinate for example, this body, can form a wash coat layer on this body, after that, can be immersed in the solution which comes to dissolve in water, for example, the water solution of chloroplatinic acid, can pull up the compound containing an active ingredient (or concentration), and can attain it by carrying out desiccation and baking. Or an active metal component is supplied with the gestalt of a particle (as for example, a platinum particle), and metallic-oxide powder support (for example, alumina support), an inorganic binder, and water are added to this, it considers as a slurry, and this is applied to a honeycomb-like body, it dries and support of the active ingredient to a honeycomb-like body is possible also by calcinating.

[0018] In the case of this invention, it is characterized by making at least two kinds of active ingredients support. Therefore, although each above-mentioned approach is available, a honeycomb is masked and it is characterized by manufacturing according to the multistage process of supporting a slurry in a need part (multistage).

[0019]

[Example]

The generation inclination of the purification engine performance of a hydrocarbon (HC) and sulfate was investigated using the catalyst structure for exhaust gas purification shown in example 1 drawing 1. In addition, the structure and the quality of the material of the concrete catalyst structure were as follows.

[0020]

[Table 3]

	ハニカム体		活性成分 の種類
	断面積比 (%)	セル数 (／ i n c h ²)	
内層	1 5	4 0 0	P t
中層	2 5	3 0 0	P d
外層	6 0	2 5 0	F e

[0021] In addition, it consists of cordierite, an active ingredient is supported by gamma-alumina support by the method of being immersed / raising from a solution, and this comes to fix a honeycomb-like body on a honeycomb body with an alumina sol binder.

[0022] The catalyst structure which the active ingredient of the following catalysts becomes from a monolayer as the example 1 of a comparison - examples 1-3 of 3 comparisons was manufactured like the example. In addition, the size and the quality of the material of the honeycomb-like body itself are the same as the thing of an example.

[0023]

[Table 4]

	セル数 (／ i n c h ²)	活性成分の種類
比較例 1	4 0 0	P t
2	3 0 0	P d
3	2 5 0	F e

[0024] It examined under the conditions of the following which simulated purification processing of the exhaust gas from the trial diesel power plant of the catalyst engine performance, and the rate of purification (%) of a hydrocarbon (HC) and the percent change of sulfate (PM) generation in various exhaust-gas temperatures (temperature of exhaust gas [in / strictly / the inlet port of the catalyst structure]) and an engine rotational frequency (space velocity (GHSV): 20,000-100,000hr⁻¹) were investigated.

[0025] Presentation NO of test condition gas: 1000ppmC₂H₄ : 1000ppmO₂: 5%helium: Remainder

[0026] This result was as having been shown in drawing 2 and drawing 3. It turns out that it has succeeded in raising the purification effectiveness of HC (particulate) significantly, controlling generation of sulfate from drawing 2 and 3, when the equipment of this invention is used.

[0027]

[Effect of the Invention] The particulate purification effectiveness in exhaust gas can be gathered without according to the catalyst structure of this invention, migrating to a large temperature region and increasing the amount of generation of sulfate.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram of a perpendicular cross section to the flow direction of exhaust gas of the 1 somatization object of the catalyst structure for exhaust gas purification concerning this invention.

[Drawing 2] It is drawing having compared and shown the rate of purification (%) of the hydrocarbon (HC) at the time of using the catalyst structure of an example and the examples 1-3 of a comparison.

[Drawing 3] It is drawing having compared and shown the percent change of the sulfate generation at the time of using the catalyst structure of an example and the examples 1-3 of a comparison.

[Description of Notations]

1: The catalyst structure for exhaust gas purification

2: A inner layer, 3:middle lamella, 4 : outer layer

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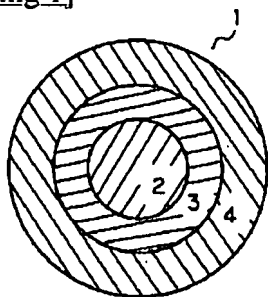
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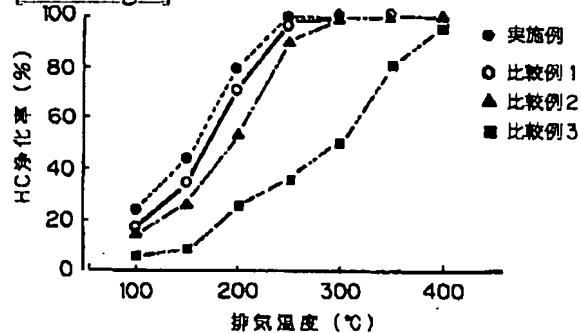
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DRAWINGS

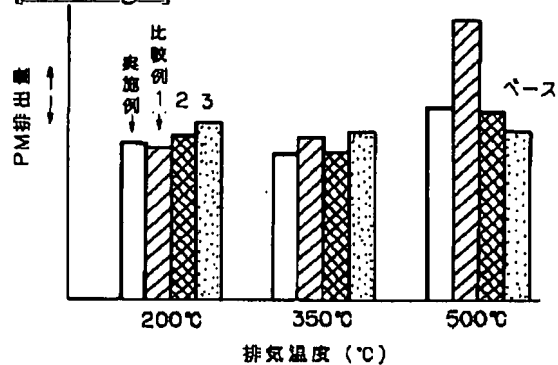
[Drawing 1]



[Drawing 2]



[Drawing 3]



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CLAIMS

[Claim(s)]

[Claim 1] It is the catalyst structure for exhaust gas purification with which the catalyst was supported by the honeycomb-like body of a monolith type. It consists of multilayer structure constituted by concentric circular to the flow direction of the exhaust gas of this structure. The catalyst structure for exhaust gas purification characterized by what the number of cells of a layer increases toward a core side from a periphery side, the strong catalyst of oxidizing power is supported by the core seen from the flow direction of exhaust gas, and the weak catalyst of oxidizing power is supported for by the periphery section.

[Claim 2] The catalyst structure for exhaust gas purification according to claim 1 characterized by the area ratio of the layer of a core to the total cross section being 5% - 50%.

[Translation done.]